

## SOLAR OBSERVATIONS

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## SOLAR RADIATION OBSERVATIONS, JANUARY 1939

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Measurements of solar radiant energy received at the surface of the earth are made at eight stations maintained by the Weather Bureau, and at nine cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Washington, D. C., Madison, Wis., Lincoln, Nebr.) and at the Blue Hill Observatory of Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau stations at Washington and Madison.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data, obtained up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, pp. 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parentheses). At Madison and Lincoln the observations are made with the Marvin pyrheliometer; at Washington and Blue Hill they are obtained with a recording thermopile, checked by observations with a Marvin pyrheliometer at Washington and with a Smithsonian silver disk pyrheliometer at Blue Hill. The table also gives vapor pressures at 8 a. m. (75th meridian time) and at noon (local mean solar time).

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, their departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of the Eppley pyrheliometer recording on either a microammeter or a potentiometer.

Direct radiation intensities averaged close to normal for January at Washington and Lincoln and above normal at Madison and Blue Hill.

Total solar and sky radiation was below normal for all stations for which normals have been computed with the exception of Washington, New York, La Jolla, New Orleans, Blue Hill, and San Juan. Beginning with this issue of the REVIEW departures from normal for Newport will be included in table 2.

No polarization measurements were made during January owing to snow and ice cover.

TABLE 1.—Solar radiation intensities during January 1939

(Gram-calories per minute per square centimeter of normal surface)

## WASHINGTON, D. C.

Date	Sun's zenith distance										Local mean solar time	
	8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°		
	75th mer. time	Air mass										
		A. M.					P. M.					
		e	5.0	4.0	3.0	2.0	1.0	2.0	3.0	4.0		5.0
Jan. 6.....	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.	
Jan. 7.....	4.75	0.76	0.90	cal.	cal.	1.21	cal.	cal.	cal.	cal.	4.95	
Jan. 7.....	5.36	.62	.77	0.96	-----	-----	-----	-----	-----	-----	5.36	
Jan. 16.....	4.17	-----	-----	-----	-----	-----	-----	0.94	-----	-----	2.45	
Jan. 17.....	2.87	-----	-----	-----	1.21	-----	-----	-----	-----	-----	2.36	
Jan. 23.....	1.52	.75	.88	1.22	1.40	-----	1.39	-----	-----	-----	1.62	
Means.....	-----	.75	(.85)	(1.08)	1.27	-----	(1.39)	(.94)	-----	-----	-----	
Departures.....	-----	-.03	-.01	+.06	+.03	-----	+.14	-.10	-----	-----	-----	

## MADISON, WIS.

Jan. 27.....	2.26	1.07	1.16	-----	-----	-----	-----	-----	-----	-----	2.26
Jan. 31.....	1.45	1.11	-----	-----	1.46	-----	-----	-----	-----	-----	1.60
Means.....	-----	(1.09)	(1.16)	-----	(1.46)	-----	-----	-----	-----	-----	-----
Departures.....	-----	+.14	+.10	-----	+.10	-----	-----	-----	-----	-----	-----

## LINCOLN, NEBR.

Jan. 5.....	2.74	1.10	1.23	1.37	-----	-----	1.39	1.26	1.15	2.87
Jan. 11.....	3.15	.58	.98	1.26	-----	-----	1.29	1.15	1.06	3.81
Jan. 17.....	2.36	.66	.89	1.16	-----	-----	-----	-----	-----	2.74
Jan. 18.....	1.96	.87	1.00	1.16	-----	-----	-----	.79	.70	2.16
Jan. 19.....	1.60	-----	-----	-----	-----	-----	1.21	1.01	.91	3.81
Jan. 20.....	3.30	.78	.91	-----	-----	-----	-----	-----	-----	3.45
Jan. 22.....	1.32	-----	-----	-----	-----	-----	1.35	1.15	1.07	.91
Jan. 25.....	2.26	-----	-----	1.45	-----	-----	1.25	-----	-----	3.45
Jan. 26.....	2.06	1.17	1.26	1.38	1.53	-----	1.35	1.21	1.09	2.36
Jan. 28.....	3.30	.79	.90	1.04	-----	-----	-----	-----	-----	4.57
Means.....	-----	.85	1.02	1.23	(1.49)	-----	1.31	1.10	1.00	-----
Departures.....	-----	-.08	-.03	+.03	+.10	-----	+.12	+.05	+.07	-----

## BLUE HILL, MASS.

Jan. 8.....	4.4	-----	-----	-----	-----	1.13	1.08	0.96	0.86	3.5
Jan. 9.....	2.4	-----	-----	-----	-----	1.24	-----	-----	-----	3.2
Jan. 10.....	4.8	-----	-----	-----	-----	-----	.89	.68	.51	6.8
Jan. 11.....	3.5	-----	-----	-----	-----	-----	-----	1.12	.96	3.0
Jan. 12.....	2.3	1.03	1.13	1.23	-----	-----	-----	-----	-----	1.7
Jan. 15.....	1.1	1.12	1.23	1.34	1.48	-----	1.30	1.23	1.07	1.2
Jan. 17.....	2.4	.94	1.11	1.23	1.39	-----	-----	-----	-----	1.6
Jan. 23.....	.3	1.14	1.24	1.33	1.45	-----	1.45	1.26	1.13	.8
Jan. 26.....	.3	1.12	1.20	1.30	1.40	-----	1.44	-----	1.07	.6
Jan. 27.....	.4	-----	-----	1.26	1.44	-----	1.42	1.27	1.15	.8
Jan. 28.....	1.1	.94	1.06	1.19	1.34	-----	-----	-----	-----	1.7
Means.....	-----	1.05	1.16	1.28	1.42	-----	1.34	1.16	1.05	.92
Departures.....	-----	+.06	+.12	+.13	+.11	-----	+.02	-.01	.00	-.01

\* Extrapolated.

TABLE 2.—Average daily totals of solar radiation (direct + diffuse) received on a horizontal surface

Week begin- ning—	Gram-calories per square centimeter																
	Wash- ington	Madison	Lincoln	Chicago	New York	Fresno	Fair- banks	Twin Falls	La Jolla	Miami	New Orleans	River- side	Blue Hill	San Juan	Friday Harbor	Ithaca	New- port
	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>	<i>cal.</i>
Jan. 1.....	175	86	179	81	99	159	8	113	246	-----	277	226	110	457	-----	68	120
Jan. 8.....	168	108	151	60	127	217	9	135	279	-----	215	263	175	507	-----	58	177
Jan. 15.....	174	128	200	59	129	147	12	121	213	-----	270	230	184	485	-----	140	191
Jan. 22.....	202	179	227	123	158	172	21	169	320	-----	208	291	200	490	-----	141	202
Departures of daily total from normals																	
Jan. 1.....	+7	-40	+4	-1	-5	+10	+1	-43	-2	-----	+102	-57	-23	+63	-----	-18	-14
Jan. 8.....	+18	-24	-32	-21	+18	+54	-1	-24	+30	-----	+13	-6	+20	+83	-----	-19	+9
Jan. 15.....	+19	-23	+6	-35	+17	-43	-1	-51	-31	-----	+53	-83	+17	+45	-----	+34	-1
Jan. 22.....	+26	-5	-2	+5	+7	-50	-7	-17	+49	-----	+10	+5	+10	+46	-----	-2	+1
Accumulated departures since Jan. 1, 1939																	
	+490	-644	-168	-364	+259	-203	-56	-945	+322	-----	+1,281	-987	+168	+1,659	-----	-35	-35